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**ARTIFICIALLY BAKED CULTURE SOIL FOR PLANT CULTURE  
AND METHOD OF MANUFACTURE THEREOF**

[Shokubutsu Saibaiyo Jinko Yakisei Baito Oyobi Sono Seizo Hoho]

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Specification

1. Title of the invention

ARTIFICIALLY BAKED CULTURE SOIL FOR PLANT CULTURE AND  
METHOD OF MANUFACTURE THEREOF

2. Claims

/2

1. An artificially baked culture soil for a plant culture, characterized by the fact that in a particle-shaped baked composition that includes a magnetic iron oxide and has a fly ash or fly ash and a clay as main materials, the water absorption rate is 20% or more; and the residual magnetic flux density is 3 gauss or more.

2. A method for manufacturing an artificially baked culture soil for a plant culture, characterized by the fact that an iron-included dust or iron-included sludge and a powder coke or coal powder are added to a fly ash or a mixture of fly ash and clay, kneaded, granulated, and baked.

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<sup>1</sup> Numbers in the margin indicate pagination in the foreign text.

### 3. Detailed explanation of the invention

[0001]

(Industrial application field)

The present invention pertains to a magnetic artificial culture soil for a plant culture and its manufacturing method.

[0002]

(Prior art)

As soil conditions essential for the growth of a plant, the following are mentioned.

(1) Drainage should be good. (2) Water retention should be good. (3) Air circulation should be good. (4) Fertilizer should be adsorbed to some degree to soil. (5) Germs should not be possessed. In order to obtain such a soil, culture soils using various soils such as Kanuma soil or Akadama soil, river sand have been researched and developed.

[0003] On the other hand, recently, the magnetism has had a large influence on the plant growth. In other words, the plant growth is accelerated by the use of a magnetic soil or magnetic water (magnetized water). Its theoretical backup is not made yet, however the magnetic effect exists apparently.

[0004]

(Problems to be solved by the invention)

However, since the above-mentioned Kanuma soil, etc., are natural products, the adjustment of particle size distribution, etc., is difficult, or the shape retention strength is weak. Also, they possess germs in accordance with the condition, resulting a critical drawback. The purpose of the present invention is to provide an artificial culture soil that can achieve both goals of the compensation of the drawback of the above-mentioned natural culture soil and the magnetization and to use an inexpensive industrial waste matter as a raw material in manufacturing the artificial culture soil.

[0005]

(Means to solve the problems)

In order to achieve the above-mentioned purpose, the present invention provides an artificially baked culture soil for a plant culture characterized by the fact that in a particle-shaped baked composition that includes a magnetic iron oxide and has a fly ash or fly ash and a clay as main materials, the water absorption rate is 20% or more; and the residual magnetic flux density is 3 gauss or more. Also, the present invention provides a method for manufacturing an artificially baked culture soil for a plant culture characterized by the fact

that an iron-included dust or iron-included sludge and a powder coke or coal powder are added to a fly ash or a mixture of fly ash and clay, kneaded, granulated, and baked

[0006]

(Operation)

In the present invention, using fly ash, iron-included dust, iron-included sludge, etc., a carbon material such as powder coke or coal powder is added to it and kneaded in a particular shape, and the particle-shaped composition is baked. Thus, the iron-included dust, iron-included sludge, etc., are reduced with the carbon material, so that a magnetite, that is, a magnetic iron oxide is generated. Also, since carbon monoxide, carbon dioxide, etc., generated in the baking process have a porous shape, the water absorption rate is raised. Then, the particle-shaped composition can be formed at an appropriate particle size required as a culture soil, and since the particle-shaped composition is baked, not only the shape retention strength required for an artificial culture soil is provided, but the sterilization treatment is achieved.

[0007] Next, the present invention is explained in detail. In the present invention, the fly ash is a coal ash when a coal is burnt, and the base of the coal ash is silica sand, feldspar, mica, clay, etc., as inclusions in the coal. Also, if it is

further granulated, if necessary, a clay may be added in accordance with the purposes such as coking property. The artificial culture soil obtained by baking it is sterilized, so that the bacterial contamination seen in natural soils is prevented and the other drawbacks, that is, the weak strength or the inappropriate particle size distribution can be solved.

[0008] As the culture soil, it is necessary to raise the water retention by raising the water absorption rate. In raising the water absorption rate, it is effective to form the culture soil to be a porous shape. For this purpose, in the present invention, the powder coke or coal powder that has a volatile component and has a reduction function is used, and an iron-included dust and a sludge are further used. Thus, the powder coke is burnt during baking, so that the water absorption rate of the baked product is raised. In other words, the "water retention" function is raised, and when the powder coke is burnt, the iron oxide portion in the dust and the sludge is reduced, so that a magnetic magnetite is generated. In other words, it is usual for general iron-included dust and sludge to include a hematite as an iron, however it is changed to a magnetite by the reduction reaction during the baking of the powder coke or coal. Thus, the magnetic magnetite is obtained, and the water absorption rate is raised by the reduction of the

powder coke, etc., due to the combustion. In other words, the water retention is good.

[0009] It is necessary for the artificially baked culture soil being obtained in this manner to have a water absorption rate of 20% or more. The reason for this is that if the water absorption rate is lower than it, it cannot be said that the performance is sufficient, compared with the conventional natural culture soils such as Kanuma soil. Also, it is necessary for the residual magnetic flux density to be 3 gauss or more. If the residual magnetic flux density is lower than it, the magnetism is too weak, so that the effect cannot be expected. Also, though there is no problem in use when the residual magnetic flux density is large, if the baking is applied at high temperature, the water absorption rate generally tends to decrease, although the residual magnetic flux density is improved, and these properties are not compatible with each other. For this reason, the residual magnetic flux density is usually set to 10 gauss or less.

[0010] Next, the good drainage or the good contact with the air can be realized by an appropriate particle size distribution of the baked product and can be easily realized by controlling /3 its granulation, etc. For the above facts, the artificial culture soil of the present invention using industrial waster



matters as raw materials can sufficiently meet the above-mentioned conditions and exhibit the magnetism. Thus, it can be said that this artificial culture soil is a new artificial culture soil.

[0011]

(Application example)

Next, tests were carried out under the following conditions.

(A) Raw material conditions

(a) Clay:fly ash:iron steel dust:powder coke = 20:60:10:10

(b) Clay:fly ash:iron steel dust:powder coke = 0:80:10:10

(c) Clay:fly ash:iron steel dust:powder coke = 0:70:20:10

(d) Clay:fly ash:iron steel dust:powder coke = 0:60:30:10

[0012] (B) Granulation conditions

An appropriate moisture is added to the above-mentioned raw material and granulated so that the particle diameter might be 3-8 mm (granulated so that the diameter of 1 mm or less might within 1%). The kneader and the granulator used are Irizhi[transliteration] mixer and pan pelletizer.

[0013] (C) Baking conditions

The above-mentioned pellet dried was baked in a rotary kiln (0.5 m in diameter x 1.5 m) so that its highest temperature

might the following value. Also, the residence time in its rotary kiln was 60 min.

(i) 950°C, (ii) 1,000°C, (iii) 1,050°C, (iv) 1,100°C, and (v) 1,150°C

[0014]

(Table I) (D) Properties of baked product

The water absorption rate, the compressive strength, the magnetite content of the baked product and the content with a diameter of 1 mm or less and the residual magnetic flux density of the baked product are respectively shown in Table I. Also, the magnetite content is calculated from a theoretical amount of saturated magnetization of the magnetite after measuring its amount of saturated magnetization. Also, as a comparative material, the properties of "Akadama" were shown. From these results, (a), (b), and (c) are good as the raw material conditions, and 1,000-1,050°C is good as the baking condition. At the same time, it can be said that the properties are much more excellent than those of the comparative material.

[0015]

(Effects of the invention)

According to the present invention, since an artificial culture soil using fly ash or iron-included dust, sludge, etc., which are industrial waste matters, as raw materials, its

industrial effect is large. Also, since the water absorption rate is large and the high-temperature baking is applied, germs do not exist, and since this artificial culture soil has a magnetism having a plant growth effect, excellent characteristics as the artificial culture soil are exerted.